Arizona Department of Environmental Quality

Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

Air Quality Division

Yuma PM_{10} Maintenance Plan
Chapters 1 - 4

DECEMBER 14, 2005

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1.0 BACKGROUND

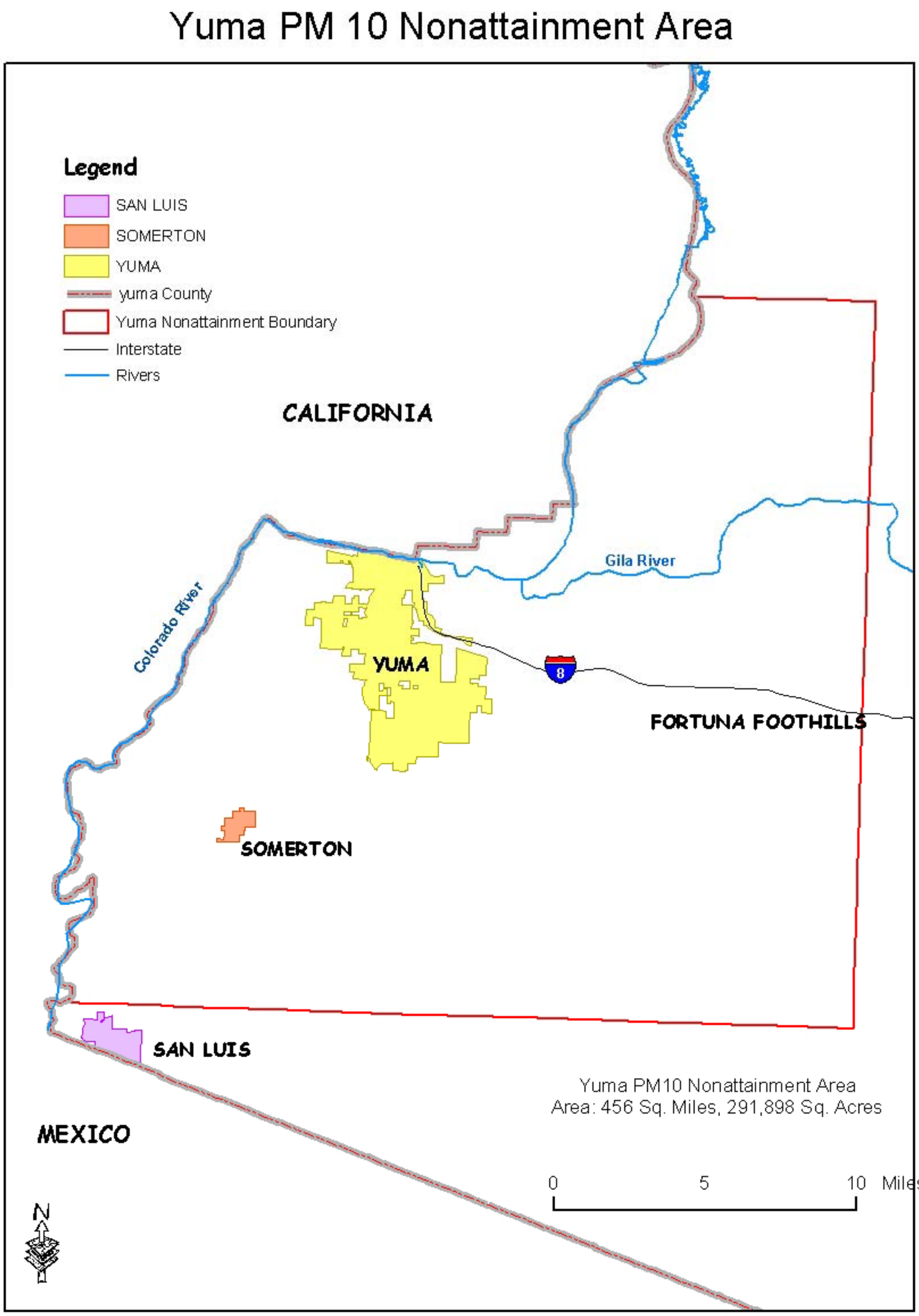
1.1 Yuma Moderate PM_{10} Nonattainment Area

Yuma County comprises the southernmost part of the Colorado River Valley. Yuma, the county seat, is located just below the confluence of the Colorado and Gila Rivers. The cities of Phoenix and Tucson are located 185 miles to the northeast and 241 miles to the east, respectively. San Diego, California is 181 miles west of Yuma, and Los Angeles is 288 miles to the northwest.

The nonattainment area is geographically located in the Lower Colorado River Valley in the southwestern part of Yuma County in a vast area of the Sonoran Desert (see Figure 1-1). The Yuma PM_{10} Nonattainment Area contains a total of 16 full and partial townships. This is the equivalent to about 12 full townships, comprising about 456 square miles or 300,000 acres. The nonattainment area is defined by the following townships (40 CFR § 81.303):

T7S- R21W, R22W;
T8S-R21W, R22W, R23W, R24W
T9S-R21W, R22W, R23W, R24W, R25W;
T10S-R21W, R22W, R23W, R24W, R25W.

Figure 1-1



Yuma PM 10 Nonattainment Area
Legend
SAN LUIS
SOMERTON
YUMA
yuma County
Yuma Nonattainment Boundary
Interstate
Rivers
CALIFORNIA
Gila River
Colorado River
YUMA
8
FORTUNA FOOTHILLS
SOMERTON
SAN LUIS
Yuma PM10 Nonattainment Area
Area: 456 Sq. Miles, 291,898 Sq. Acres
MEXICO
0
5
10 Miles
N

1.2 Climate

Yuma is Arizona's warmest winter city and the sunniest year-round place in the United States, with an annual average of 4,133 hours of sunshine. Yuma has a classic low desert climate with extremely low relatively humidity and very high summer temperatures. Yuma is one of the driest cities of its size in the United States, with a mean annual precipitation of 2.94 inches, based on a 30-year average. It lies too far south to benefit from the winter fronts which impact northern Arizona and it lies too far west to receive rain associated with the summer monsoons.

Table 1-1 depicts the monthly climate summary for Yuma. The table was compiled by the Western Regional Climate Center from data for Yuma from September 1, 1945, to March 31, 2005. Although the winters in Yuma are rather mild, the summers are very hot. Table 1-1 reveals that July is the hottest month with an average maximum temperature of 107.0°F. January is the month with the lowest average maximum temperature with an average maximum temperature of 68.5°F.

With respect to average minimum temperatures, July is the month with the highest average minimum temperature of 80.4°F. The month with the lowest average minimum temperature is January at 44.1°F.

Table 1-1

Yuma Monthly Climate Summary													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (F)	68.5	74.3	79.2	86.8	94.0	103.4	107.0	105.8	101.6	91.0	77.7	68.7	88.2
Average Min. Temperature (F)	44.1	46.9	51.0	56.9	63.7	72.1	80.4	79.9	73.8	62.4	51.0	44.4	60.6
Average Total Precipitation (in.)	0.43	0.22	0.23	0.12	0.05	0.01	0.22	0.51	0.27	0.29	0.19	0.43	2.96

Period of Record: 9/1/1945 to 3/31/2005

SOURCE: Western Regional Climate Center

1.3 Population

The principal communities in the Yuma PM_{10} Nonattainment Area are the Cities of Yuma and Somerton. Since 1970, the population of Yuma has increased more than two and one-half times while the population of Somerton has more than tripled. After adjusting for the La Paz County split, Yuma County experienced a similar growth pattern by tripling its population during the same time period. Similarly, Arizona's population also tripled.

During the 1970s, Yuma County grew at a rate of 25.3 percent while Yuma and Somerton grew at rates of 46.4 percent and 78.4 percent, respectively. The growth rates of Yuma and Somerton were similar during the 1980s and 1990s. Yuma County, however, grew at a greater rate during both the 1980s (40.3%) and 1990s (49.7%). Decennial census data for Yuma, Somerton, and Yuma County are shown in Table 1-2.

The Census population noted above does not take into account the Yuma area's seasonal population. Norton Consulting estimates that 56,000 winter visitors/residents were in the Yuma Metropolitan Statistical Area (MSA) in mid-February (2005), the traditional peak of the season. The winter visitors come to Yuma to enjoy the mild winter climate.

Table 1-3 portrays 1997 growth projections by the Arizona Department of Economic Secuirty (DES) for the cities of Yuma, Somerton, and Yuma County in five-year increments from 2000 to 2015. Projected populations for Yuma and Yuma County for 2000 and 2005 are significantly less than the 2000 Census enumerated populations. Likewise, the projected population for Somerton for 2000 is less than the 2000 Census enumerated population. In 2015, the City of Somerton is projected to have a population of 9,001. This amounts to a projected increase of 23.9.7% over its 2000 census population. The projected 2015 population for the City of Yuma is 90,271. This is a projected increase of 16.5% over Yuma's 2000 census population. Yuma County's 2015 projected population is 189,783. This amounts to a projected increase of 18.6%.

Table 1-2. Decennial Census Population of Yuma, Somerton, and Yuma County: 1970-2000

Year	April 1 2000	April 1 1990	April 1 1980	April 1 1970
Yuma	77,515[1]	56,966	42,481	29,007
Yuma's decennial change	36.1%	34.1%	46.4%	
Somerton	7,266	5,282	3,969	2,225
Somerton's decennial change	37.6%	3.1%	78.4%	
Yuma County	160,026	106,895	76,205	60,827
Yuma County's decennial change	49.7%	40.3%	25.3%	

SOURCE: U.S. Bureau of the Census, decennial census counts. The northern part of Yuma County was split into La Paz County with the southern part retained as Yuma County on January 1, 1983. The 1980 Yuma County population does not contain the population that was enumerated in the La Paz County portion. The 1970 Census comprises the original Yuma County boundary.

[1]The 2000 Census shows a population of 77,515 with 34,475 housing units of which 26,649 are occupied (22.7% vacant). The number of occupied housing units equals the number of household residing in Yuma with 2.79 persons per household. Yuma also has a group quarters population of 3,144. Persons not living in households are included in group quarters. Group quarters is classified into institutionalized persons (patients or inmates) and noninstitutionalized persons (rooming houses, group homes, dormitories, shelters, and similar quarters).

Table 1-3. Population Projections for Yuma, Somerton, and Yuma County: 2000 - 2015

Year	July 1, 2000	July 1, 2005	July 1, 2010	July 1, 2015
Yuma	67,809	74,347	81,836	90,271
Somerton	6,729	7,475	8,224	9,001
Yuma County	138,025	154,582	171,689	189,783

Source: Arizona Department of Economic Security, August 1, 1997. DES has not produced any new population projections for Arizona since 1997.

1.4 Economy

Growth in Yuma County is positive. Yuma County is currently among the better-performing counties in the state, thanks to healthy job growth in services. The government is adding jobs in Yuma, which provides a significant boost to the local economy.

Agriculture is the primary industry in Yuma, and its health helped offset some of the economic downturn. Agriculture contributed over $800 million to Yuma County's economy, and employed almost 9,000 locally in 2002. Yuma County also ranks highest in Arizona in terms of crop production and livestock raising.

Yuma County's net cash farm income in 2002 was over $338 million, amounting to 51.8% of the total net cash farm income for all of Arizona. Yuma County ranked first in the state in the production of Durum wheat for grain, land in orchards, acres in vegetables, and winter wheat for grain in 2002; it ranked second in the state in the production of Pima cotton in 2002.[2]

Yuma County is the Nation's winter salad bowl, producing 85-90% of the Nation's winter vegetables. There are times during mid-winter and into the early spring when fully 90-95% of the iceberg lettuce for the United States and Canada comes from Yuma County fields.

[2] U. S. Census of Agriculture, 2002.

The tourism industry in Yuma has remained healthy, despite fears of a potential drop in tourist traffic following the terrorist attacks that occurred on September 11, 2001. The industry has seen a significant expansion of capacity in new RV parks and hotels. Since most of Yuma's visitors arrive via automobile, tourism has only been moderately affected by the recent economic slowdown. The summer tourist season is not as important in Yuma.

The government, and especially the military, plays a major role in the local economy. Home to the Marine Corps Air Station and the U.S. Army Garrison Yuma, the military presence in Yuma is estimated to generate almost $260 million annually in terms of an economic impact on the metro area.

Job growth in Yuma County will accelerate in the coming year. Population growth and low business costs will remain the two structural drivers for growth in the metro area. Yuma County will continue to struggle with volatile employment growth and high unemployment. The jobs that it creates will remain low paying and often seasonal. However, the military presence is a stabilizing force and could provide a short-term boost. Longer term, Yuma County will be one of the better performing counties in the nation due to strong in-migration.

Table 1-4 presents employment data by sectors for Yuma County for the years 2000-2005. Table 1-4 reveals significant increases in employment in the government and services sectors between 2000–2005. The trade, transportation, communication, and public utilities sector has experienced a significant decrease during the same time frame. The government and services sectors represent the largest two sectors, comprising 41.8 percent of total labor force of Yuma County in January, 2005.

Table 1-4. Employment by Sector for Yuma County: 2000–2005

Employment Sector	2000	2001	2002	2003	2004	2005
Total civilian labor Force	60,000	66,500	64,300	69,300	73,500	74,200
Unemployment	10,150	7,600	7,100	8,100	8,400	7,300
Total employment	49,850	58,900	57,200	61,200	65,100	66,900
Nonfarm employment	40,650	43,100	44,000	47,000	49,200	53,500
Mining and construction	2,650	3,000	3,200	3,300	3,800	4,700
Manufacturing	2,150	2,300	2,300	3,100	3,600	3,300
Trade, transportation, communication, and public utilities	14,225	10,600	9,800	10,100	10,500	11,900
Financial activities	1,375	1,300	1,300	1,300	1,400	1,400
Services	9,675	13,500	14,500	15,400	15,900	16,800
Government	10,575	11,500	12,000	12,800	12,900	14,200

Source: Arizona Department of Economic Security, 2005

Table 1-5 shows a selected time series of civilian labor force data for the City of Yuma and Yuma County for the timeframe 2000–2004. Data for 2005 were not available at the time of this writing. Table 1-5 reveals that for every year during this timeframe, the unemployment rate for Yuma County was over 20 percent. The unemployment rate for Yuma County was significantly higher than that for the City of Yuma. The unemployment rate for the City of Yuma is in itself rather high, at times approaching 20 percent.

Table 1-5. Civilian Labor Force Data for City of Yuma and Yuma County

Year	2000	2001	2002	2003	2004
City of Yuma civilian labor force	36,804	36,837	38,952	39,642	40,607
City of Yuma unemployment rate	19.6%	16.9%	16.4%	16.3%	15.8%
Yuma County civilian labor force	70,242	69,322	73,120	74,377	75,982
Yuma County unemployment rate	27.8%	24.3%	23.7%	23.5%	22.9%

Source: Arizona Department of Economic Security, 2005. Data represent annual averages.

1.5 Yuma Area Air Quality History

The Yuma area was designated as a moderate PM_{10} nonattainment area by operation of the 1990 Clean Air Act Amendments. The area violated the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS)[3] in 1990 and 1991 and had violated the annual NAAQS[4] in 1989 and violated the NAAQS again in 1990. ADEQ completed a state implementation plan (SIP) for the Yuma Moderate PM_{10} Nonattainment Area in 1991. Although the plan demonstrated attainment of the 24-hour and annual NAAQS through reasonable available control measures (RACM), EPA found the plan to be incomplete. ADEQ identified additional RACM being implemented in the Yuma area and updated the plan in 1994. Based on these additional control measures, the 1994 plan demonstrated attainment of the PM_{10} NAAQS by even a greater margin. ADEQ adopted the 1994 plan and sent it to EPA. EPA has never approved the SIP for the Yuma

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[3] The 24-hour average PM_{10} standard is 150 *u*g/m^3. Concentrations at or below this amount are not a violation of the 24-hour standard. The 24-hour average PM_{10} monitored values for the Yuma area were 270 *u*g/m^3 in 1990 and 229 and 188 *u*g/m^3 in 1991.

[4] The annual average standard is 50 *u*g/m^3. Concentrations at or below this amount are not a violation of the annual standard. The annual average PM_{10} monitored values for the Yuma area were 52 *u*g/m^3 in 1989 and 57 *u*g/m^3 in 1990.

area.

Since 1991, the Yuma area had not violated either the 24-hour or annual NAAQS up until 2002. As a result of several years of “clean data”, ADEQ began developing a maintenance plan and redesignation request for the Yuma area in 2001, believing that the improvements of the local air quality were permanent and enforceable. ADEQ identified the various stakeholders in the Yuma area; these stakeholders include the local jurisdictions, the metropolitan planning organization, the agricultural community, federal agencies, two Native American tribes, the water users’ association and irrigation districts, and the Arizona Department of Transportation. ADEQ began working with the stakeholders in July, 2001 in developing the maintenance plan and redesignation request and continued to do so until an exceeedance of the 24-hour NAAQS occurred once again in Yuma on August 18, 2002. As a result of this exceedance, the maintenance plan was temporarily postponed until ADEQ completed a natural events action plan (NEAP) for the Yuma area.

The exceedance on August 18, 2002 was due to a high wind event. High wind events are a type of natural event covered by EPA’s Natural Events Policy (NEP). Under the NEP, ADEQ developed and submitted a natural events action plan (NEAP) to EPA on February 17, 2004. The NEAP contains strategies that are currently being implemented by the local jurisdictions in the Yuma area to reduce particulates in the event of future high wind conditions in the Yuma area.

The NEP states that best available control measures (BACM) must be implemented for contributing sources of PM_{10} event within 3 years after the first NAAQS violation attributed to high wind events. Consequently, ADEQ completed a report on the implementation of the BACM contained in the Yuma NEAP. ADEQ submitted the NEAP implementation report to EPA on February 17, 2005.

Having completed the NEAP, ADEQ is now in the process of completing this maintenance plan.

2.0 Clean Air Act Regulatory Requirements

As a consequence of being designated nonattainment for the PM_{10} NAAQS, the Yuma area is required under the Clean Air Act Amendments (CAAA) of 1990 to meet certain legal requirements to attain the NAAQS and ensure that the area will comply with the NAAQS for the 10-year maintenance period following redesignation. The specific legal requirements are described below.

2.1 CAA Section 110(a)(2) – Enforceable Emissions Limitations and Other Control Measures

Section 110(a)(2)(A) of the CAA requires States to provide for enforceable emissions limitations and other control measures, means, or techniques, as well as schedules for compliance with the PM_{10} national ambient air quality standards. Chapter 6 includes a list of control measures that helped the Yuma area reach attainment and maintain the PM_{10} NAAQS up to the maintenance out-year of 2016.

Section 110(a)(2)(B) of the CAA requires States to monitor, compile, and analyze PM_{10} monitoring data on ambient air quality. Under ADEQ's air quality assessment program, ambient monitoring networks for air quality have been established to sample pollution in a variety of representative settings, to assess the health and welfare impacts, and to assist in determining air pollution sources. These networks cover both urban and rural areas of the State. Chapter 3 includes monitoring network information and data for the Yuma area. The samplers are certified as Federal Reference or Equivalent Methods. The protocol for PM_{10} monitoring used by the State, local agencies, and companies was established by EPA in 40 CFR Part 50, Appendices J and K and 40 CFR Part 58, Appendices A, D, and E.

Section 110 (a)(2)(C), Section 110 (a)(2)(E), Section 110 (a)(2)(F), and Section 110 (a)(2)(L) of the CAA requires States to have permitting, compliance, and source reporting authority. Arizona Revised States (ARS) § 49-402 establishes ADEQ's permitting and enforcement authority. As authorized under ARS § 49-402, ADEQ retains adequate funding and employs adequate personnel to administer the air quality program. Appendix 1 includes the organizational chart for ADEQ's Air Quality Division.

Under ADEQ's air quality compliance program, major sources are inspected annually, while minor sources are inspected every two to three years. However, minor sources may be inspected more frequently if they have had a record of problems in the past.

Section 110(a)(2)(G) of the CAA requires that States provide for authority to establish emergency powers and authority and contingency measures to prevent imminent endangerment. AAC R18-2-220 prescribes the procedures the Director of ADEQ shall implement in order to prevent the occurrence of ambient air pollution concentrations which would cause significant harm to the public health. As authorized by ARS § 49-426.07, ADEQ may seek injunctive relief upon receipt of evidence that a source or combination of sources is presenting an imminent and substantial endangerment to public health or the environment.

2.2 CAA Section 172(c) – Nonattainment Area Plan

Section 172(c) of the CAA requires that nonattainment plan provisions comply with each of the following:

Section 172(c)(1) of the CAA requires that nonattainment plan provisions provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable and demonstrate attainment of the primary NAAQS. Chapter 6 includes a description of RACMs already implemented in the Yuma area to control PM_{10} emissions.

Section 172(c)(3) and Section 172(c)(4) of the CAA require a current inventory of actual emissions from all sources of the relevant pollutant or pollutants and projected emission inventories. The 1999 base-year emissions and the 2016 projected emissions for the Yuma Nonattainment Area are contained in Chapter 4.

Section 172(c)(5) of the CAA require permits for the construction and operation of new or modified major stationary sources. All new sources and modifications to existing sources in Arizona are subject to State requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 1, 3, 4, and 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules, including Nonattainment Area Analysis (NAA) and Prevention of Significant Deterioration (PSD). The State NSR program was conditionally approved by EPA in 1982, but since then has been revised and is currently awaiting approval from EPA.

2.3 CAA Section 175A(d) – Contingency Provisions

Section 175A(d) requires the maintenance plan to contain contingency provisions that will assure that the State will promptly correct any violation of the PM_{10} NAAQS which occurs after the redesignation of the area as an attainment area. The provisions must also include a requirement that the State will implement all the control measures contained in the state implementation plan for the area before the redesignation of the area as an attainment area. Chapter 6 contains the control measures currently implemented in the Yuma area. Chapter 7 contains the contingency measures that will be implemented in the Yuma area in case of a future violation.

2.4 CAA Section 176(c)(1) – General Conformity

The CAA contains general conformity requirements that currently apply to federal agency-related activities, except transportation projects,[1] in the Yuma Moderate PM_{10} Nonattainment Area (40 C.F.R. §§ 93.150 - 160). The same requirements will continue to apply when the Yuma area is legally designated a maintenance area. The regulations are intended to ensure federal actions are consistent with state and local air quality planning. A conformity analysis

[1]The Clean Air Act requires that transportation plans, programs, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration or Federal Transit Authority be in conformity with the state implementation plan through a separate process described in the transportation conformity regulation (Title 40 C.F.R., Parts 51 and 93, November 24, 1993, as amended in August and November 1995).

must clearly demonstrate that federal projects will not: 1) cause or contribute to any new violations of the NAAQS; 2) interfere with provisions in the applicable SIP for compliance with the NAAQS; or 3) increase the frequency or severity of NAAQS violations. Any federal agency engaging, sponsoring, permitting or approving an action in the Yuma Nonattainment Area is responsible for making the conformity determination, in consultation with ADEQ. Those federal agencies in the Yuma area that must comply with the general conformity requirements are the BLM, BOR, Federal Aviation Administration (FAA), Department of Homeland Security, Marine Corps Air Station (MCAS), and the U.S. Army Garrison Yuma (AGY).[2] Chapter 7 contains ADEQ's commitment to enforce Article 14 of the Arizona Administrative Code. ADEQ has incorporated by reference Title 40 CFR Part 93, Subpart B in Arizona Administrative Code R18-2-1438.

2.4.1 Commitment to Meet General Conformity Requirement

ADEQ commits to work with the Federal agencies in the Yuma Moderate PM_{10} Maintenance Area to ensure that the CAA Sections 118 and 176 and 40 C.F.R. §§ 93.150 - 160 will be met for applicable federal projects. Examples given by EPA Region IX of Federal actions that have required conformity determinations in the past include: construction of a water treatment facility on federal land; construction of a new airport runway; expansion of a mine or quarry operation owned or operated by a Federal agency; residential housing construction on military installations; and increased aircraft and motor vehicle activity on military installations.[3]

2.5 CAA Section 176(c)(2) – Transportation Conformity

The CAA of 1977 contains transportation conformity requirements which state that transportation plans, programs, and projects in nonattainment areas cannot:

- cause NAAQS violations;
- increase the frequency or severity of existing NAAQS violations; or
- delay attainment of the NAAQS for the relevant pollutants in nonattainment areas.

The CAA requires that transportation improvement programs (TIPs), plans, and projects in nonattainment or maintenance areas that are funded or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) be in conformity with state implementation plans, including maintenance plans. The conformity process is described in EPA's transportation conformity regulation Title 40 CFR Part 93, Subpart A. Other projects that must undergo a transportation conformity analysis include:

[2] Arizona's general conformity program was submitted to EPA as a SIP revision in 1995. To date, it has not been approved; therefore, the Federal rules apply until such approval.

[3] These examples of activities requiring a conformity analysis were provided in a personal communication with Doris Lo, Environmental Program Specialist, in the EPA Region IX Air Division Planning Office.

- regionally significant[4] transportation projects not funded or approved by FHWA and/or FTA, but sponsored by recipients of FHWA/FTA funds an
- regionally significant projects in rural nonattainment or maintenance areas.

2.5.1 Agencies Responsible for Transportation Conformity Determinations

The Yuma Metropolitan Planning Organization (YMPO) and the U. S. Department of Transportation (USDOT) have the responsibility to ensure that the transportation plans and programs within the Yuma Nonattainment Area conform to the maintenance plan. The policy board of the YMPO must formally make a conformity determination regarding its transportation plan and TIP prior to submitting them to the U.S. DOT for review and approval.

2.5.2 Frequency of Transportation Conformity Determinations

Conformity determinations must be made at least every three years, or as changes are made to plans, TIPs, or projects. Certain events may also trigger new conformity determinations; for example:

- SIP revisions that establish or revise a transportation-related emissions budget or

- SIP revisions that add or delete transportation control measures (TCMs).

2.5.3 Motor Vehicle Emissions Budget

The foundation for a conformity determination is the motor vehicle emissions budget in the latest submitted or approved SIP. The motor vehicle emissions budget in the SIP acts as a ceiling for the transportation plan and TIP emissions. The motor vehicle emissions budget for the Yuma Nonattainment Area is contained in Chapter 5.

2.5.4 ADEQ's Role in Implementing Transportation Conformity

The Clean Air Act Amendments of 1990 made conformity requirements substantially more rigorous. In November 1993, EPA issued its final rulemaking (58 FR 62188) implementing the new requirements. ADEQ was subsequently required to adopt an Arizona transportation conformity rule (A.A.C. R18-2-1401 through 1438) that was enforceable by the State and submit the rule to EPA as a revision to the SIP. ADEQ submitted the rule to EPA on June 20, 1995.

[4]"Regionally significant project" means a project that serves regional transportation needs and would normally be included in the modeling of a metropolitan area's transportation network. This includes, as a minimum, all principal arterial highways and all fixed guide-way transit facilities that offer a significant alternative to regional highway travel.

In July 1997, EPA revised its 1993 rule, providing state and local governments more authority in setting performance measures as tests of conformity. The 1997 rule also gave state and local governments more discretion at times when transportation plans do not conform to the SIP. ADEQ was required to revise its State rule to reflect the changes in EPA's 1997 rule and submit the updated rule as a SIP revision. As the result of the March 2, 1999, U.S. Circuit Court decision[5], ADEQ is in the process of revising its transportation conformity rule.

2.6 CAA Section 189 – Plan Provisions and Schedules for Plan Submissions

2.6.1 Permit Requirements

Section 189 requires that the state implementation plan for the Yuma area include a permit program providing that permits meeting the requirements of section 173 are required for the construction and operation of new and modified major stationary sources of PM_{10}. All new sources and modifications to existing sources in Arizona are subject to State requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 1, 3, 4, and 5. All new major sources and modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules, including Nonattainment Area Analysis (NAA) and Prevention of Significant Deterioration (PSD). The State NSR program was conditionally approved by EPA in 1982, and has been revised since then. A revision was submitted in 1995 but never approved. The program will be revised and resubmitted in 2006.

2.6.2 Attainment or Nonattainment Demonstration

Section 189 requires that the state implementation plan for the Yuma area include a demonstration that the plan will provide for attainment by the applicable attainment date or a demonstration that attainment is impracticable by that date. The 1991 Yuma SIP demonstrated attainment of the PM_{10} 24-hour and annual NAAQS by December 31, 1994. The 1994 revision to the SIP demonstrated attainment by an even greater margin.

2.6.3 Provisions to Implement Reasonably Available Control Measures

[5]On March 2, 1999, the U.S. Court of Appeals for the District of Columbia issued its opinion in Environmental Defense Fund (EDF) v. Environmental Protection Agency (No. 97-1637). The Court ruled against EPA on all issues. The Court ruled that EPA's 1997 rule, which allowed non-federally funded projects to be approved when the conformity status of a transportation plan or program has lapsed, violates the CAA requirement that all projects come from a currently conforming transportation plan and program. The Court also ruled that EPA's 1997 rule, which allowed projects previously found to conform with a SIP and approved for federal funding when the conformity status of a transportation plan and program has lapsed, violates the CAA requirement that all projects come from a currently conforming transportation plan and program. The Court ruled that EPA must harmonize the use of the emissions budget in currently disapproved SIPs with the CAA requirement that federal agencies affirmatively find that federal actions will not cause or contribute to new air quality violations, increase the frequency or severity of existing violations or delay timely attainment of the NAAQS. There is no longer a 120-day grace period before projects are frozen if a SIP is disapproved.

Section 189 requires the plan for the Yuma area to contain provisions to assure that the RACMs for the control of PM_{10} be implemented no later than December 10, 1993. The local jurisdictions in the Yuma area had implemented their RACMs by this date and these control measures were enough to bring the area into attainment by December 31, 1994. The control measures that are being implemented in the Yuma area are contained in Chapter 6.

2.7 Applicable Clean Air Act Requirements with Respect to Redesignation

2.7.1 Redesignation to Attainment

Section 107(d)(3)(E) of the Clean Air Act (CAA), as amended, states that an area can be redesignated to attainment if the following conditions are met:

a) The NAAQS have been attained[6].

Chapter 3 makes the case that the 24-hr PM10 NAAQS and the annual average PM_{10} NAAQS have both been attained based on the most recent three years of monitoring data.

b) The applicable implementation plan has been fully approved under Section 110(k).

Since EPA is in the process of making a clean data finding for Yuma, EPA is not required to approve the 1994 Yuma State Implementation Plan. Under the clean data finding, the requirement to fully approve the applicable state implementation plan is waived.

c) The improvement in air quality is due to permanent and enforceable reductions in emissions.

Sections 1.3 and 1.4 of this Chapter described the population and economic growth that has been occurring in Yuma and Yuma County. Chapter 3 reveals that there has not been a violation of the PM_{10} NAAQS in Yuma since 1991. Chapter 6 describes the control measures that are currently in place to control PM_{10} emissions in the Yuma area and attain the NAAQS. Clearly, the improvement in air quality in Yuma is due to permanent and enforceable reductions in PM_{10} emissions. These reductions are expected to maintain the Yuma area in compliance with the PM_{10} NAAQS to at least 2016, the out-year of the maintenance plan.

d) A maintenance plan with contingency measures has been fully approved under Section 175A.

[6]Attainment of the 24-hour standard is determined by calculating the expected number of days in a year with PM_{10} concentrations greater than 150 ug/m^3. The 24-hour standard is attained when the expected number of days with levels above 150 ug/m^3 (average over a three year period) is less than or equal to one. Attainment of the annual PM_{10} standard is achieved when the annual arithmetic mean PM_{10} concentration over a three-year period is equal to or less than 50 ug/m^3 [40 CFR 50.6 (a) and (b)].

This document is the PM10 maintenance plan for the Yuma area. The contingency measures for Yuma are contained in Chapter 6. ADEQ has every expectation that EPA Region IX will fully approve this maintenance plan when submitted to EPA in the spring of 2006.

e) The State has met all applicable requirements for the area under Section 110 and Part D.

ADEQ's fulfillment of these requirements are described in detail in Section 1.0 of Chapter 2 of this plan.

2.8 Applicable EPA Guidance

In the process of completing the maintenance plan for Yuma and fulfilling the requirements of a maintenance plan fully approvable by EPA, ADEQ referred to the guidance documents listed below:

a) PM_{10} SIP Development Guideline, U.S. Environmental Protection Agency, OAQPS, EPA-450/2-86-001, Research Triangle Park, NC, June 1987;

b) Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni, Director, Air Quality Management Division, memorandum dated September 4, 1992;

c) PM_{10} Emission Inventory Requirements, U.S. Environmental Protection Agency, OAQPS, Research Triangle Park, NC, September 1994; and

d) Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard, John S. Seitz, Director, Office of Air Quality Planning and Standards (MD-10), May 15, 1995.

2.9 Requirements for Nonattainment Areas that Have Attained the NAAQS

EPA's clean data policy applies to ozone nonattainment areas that are meeting the ozone NAAQS. Specifically, EPA waives certain requirements under CAA Section 172(c), including developing attainment demonstrations and reasonable further progress (RFP) demonstrations, for these nonattainment areas. If these areas have not had any violations of the ozone NAAQS for three consecutive years, as demonstrated through monitoring data, EPA deems these areas to have already attained the NAAQS and to have met RFP.[7] EPA also applies this "clean data policy" to PM_{10} nonattainment areas with simple PM_{10} source problems, such as fugitive dust problems and residential wood combustion, if they meet certain requirements. If these requirements are met, the PM_{10} nonattainment areas are not required to develop an attainment

[7] *Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard*, John S. Seitz, Director, Air Quality Planning and Standards (MD-

demonstration and RFP. The requirements for the policy and how the Yuma area meets these requirements are described below:

1. The area must be attaining the PM_{10} NAAQS based on the three most recent years of quality assured monitored air quality data.

Chapter 3 reveals that the Yuma monitoring site during the period of 2002–2004 showed one measured exceedance (170 ug/m^3) of the 24-hour PM_{10} NAAQS, due to a natural wind event in the Yuma area. ADEQ flagged this event pursuant to EPA's Natural Events Policy (NEP) and Arizona's Natural and Exceptional Events Policy (NEAP) 0159.000 and EPA concurred. Consequently, this reading has been excluded from the attainment calculation for Yuma. Review of the 24-hour averages for calendar years 2002, 2003, and 2004 reveals that the highest 24-hour average was 127 ug/m^3; review of the annual standard reveals that the 3-year annual average was 43.4 ug/m^3. Thus, the Yuma area also attained the annual PM_{10} NAAQS.

2. The State must continue to operate an appropriate PM_{10} air quality monitoring network, in accordance with 40 CFR Part 58, in order to verify the attainment status of the area.

The State continues to operate the Yuma monitoring network, in accordance with 40 CFR Part 58, in order to verify the attainment status of the area. The Yuma monitoring network is described in Chapter 3 of this plan.

3. The control measures for the area, which were responsible for bringing the area into attainment, must be approved by EPA as meeting reasonably available control measures (RACMs) and reasonably available control technology (RACT) requirements.

The control measures for the area, which were responsible for bringing the area into attainment, are described in Chapter 6 of this plan. The State anticipates that EPA will approve these measures as meeting RACM and RACT requirements. In addition, the BACM developed for the Natural Events Action Plan (NEAP) are included in Chapter 6.

4. An emissions inventory must be completed for the area.

An emissions inventory has been completed for the Yuma area, and a detailed description is contained in Chapter 4 of this plan.

5. EPA must make a finding that the area attained the 24-hour and annual PM_{10} NAAQS.

PM_{10} concentrations reported at the Yuma monitoring site between 2002 and 2004 showed no measured exceedance of the 24-hour PM_{10} NAAQS. Thus, the three-year

10), memorandum dated May 25, 1995, page 3.

average was less than one exceedance per year, which demonstrates Yuma attained the 24-hour PM_{10} NAAQS. The highest 24-hour reading was 127 ug/m^3, well below the 150 ug/m^3 24-hour NAAQS. Review of the annual standard for calendar years 2002, 2003, and 2004 reveals that the 3-year annual average was 43.4 ug/m^3; thus, the Yuma area also attained the annual PM_{10} NAAQS. Based on these clean data for 2002–2004, ADEQ requests that EPA make the finding that the Yuma area has attained the 24-hour and annual PM_{10} NAAQS.

In addition to these requirements, any requirements that are connected solely to designation or classification, such as new source review (NSR) and RACM/RACT, must remain in effect. Chapter 6 includes a description of RACMs implemented in the Yuma area to control PM_{10} emissions. It also contains a description of BACMs included in the Yuma NEAP. Chapter 7 contains the State's commitment to enforce NSR and RACM/RACT. However, the requirement under CAA Section 172(c) for reasonable further progress (RFP) demonstrations is waived due to the fact that the Yuma area has already attained the PM_{10} NAAQS and met RFP as demonstrated in recent monitoring readings. Finally, transportation and general conformity requirements continue to apply in the Yuma area. The use of the clean data policy does not constitute a CAA Section 107(d) redesignation, but only serves to approve nonattainment area SIPs required under Part D of the CAA.

2.10 Clean Air Act Requirements for Maintenance Plans

Section 107(d)(3)(E) of the CAA stipulates that for an area to be redesignated, EPA must fully approve a maintenance plan that meets the requirements of Section 175A. Section 175A defines the general requirements of a maintenance plan. These requirements are as follows:

1. The maintenance plan is a SIP revision.

The maintenance plan must provide for maintenance of the relevant NAAQS in the area for at least ten years after redesignation. Chapter 6 demonstrates that the control measures in place in the Yuma area are adequate to maintain the PM_{10} NAAQS until the out-year 2016. The year 2016 is projected to be at least ten years after the Yuma area is redesignated to attainment.

2. The maintenance plan shall contain additional control measures necessary to ensure maintenance of the PM_{10} NAAQS.

Section 175A of the CAA states that the maintenance plan shall contain additional measures, if necessary, to ensure maintenance of the relevant NAAQS for ten years after redesignation. The control measures in Chapter 6 of this plan demonstrate that no additional control measures are needed. The control measures already being implemented in the Yuma area are adequate to ensure maintenance of the PM_{10} NAAQS until 2016.

3. The maintenance plan must be revised eight years after redesignation.

Section 175A also requires that the state submit a revision of the maintenance plan eight years after the original redesignation request is approved to provide for the maintenance of the NAAQS for an additional ten years following the first 10-year period. ADEQ commits to revise this maintenance plan in Chapter 7.

4. The maintenance plan must contain contingency measures.

The maintenance plan must contain contingency measures to ensure prompt correction of any violation of the NAAQS. At a minimum, the contingency measures must include a requirement that the State will implement all measures contained in the nonattainment SIP prior to redesignation. Activating the contingency plan as a result of a violation of the NAAQS will not necessitate a revision of the SIP unless required by the EPA Region IX Administrator. Chapter 6 describes the contingency measures contained in this maintenance plan and the trigger for them.

5. Core Provisions

In addition to the requirements listed above, the maintenance plan should contain core provisions that will be necessary to ensure maintenance of the relevant NAAQS in the area seeking redesignation from nonattainment to attainment.

a. The state should develop an attainment emissions inventory.

EPA has made a clean data finding for Yuma. As a result of this finding, ADEQ is not required to develop an attainment emissions inventory for the Yuma area.

b. The state should make a maintenance demonstration.

The state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of the relevant pollutant will not exceed the level of the attainment inventory or by modeling to show that the future mix of sources and emission rates will not cause a violation of the NAAQS. The demonstration should be for a period of ten years following the redesignation. This demonstration is made in Chapter 5.

c. The state should continue to operate its monitoring network.

Once an area has been redesignated, the state should continue to operate an appropriate air quality monitoring network, in accordance with 40 CFR Part 58, to verify the attainment status of the area. The maintenance plan should contain provisions for continued operation of air quality monitors that will provide such verification. ADEQ commits to operate the air quality monitor on a continual basis in the Yuma area in Chapter 7.

d. The state should verify continued attainment.

The state should ensure that it has the legal authority to implement and enforce all measures necessary to attain and to maintain the NAAQS. A.R.S. § 49-404 and A.R.S. § 49-406 provide this authority to Arizona.

e. The state should develop and be ready to implement a contingency plan.

Section 175A of the CAA requires that a maintenance plan include contingency provisions, as necessary, to promptly correct any violation of the NAAQS that occurs after redesignation of the area. These contingency measures are different than those generally required for nonattainment areas under Section172(c)(9). For the purposes of Section 175A, the contingency measures do not have to be fully adopted in order for the maintenance plan to be approved. Chapter 6 describes the contingency measures to be implemented in the Yuma area, if the need arises.

2.11 NEAP Policies and Requirements

In addition to CAA requirements, NEP policy requirements must also be fulfilled in the Yuma area. The following section goes into the specific requirements as they related to the Yuma area.

2.11.1 Overview

High wind events, like the event that occurred in Yuma on August 18, 2002, are a type of natural event covered by EPA's NEP (Areas Affected by PM-10 Natural Events, Memorandum, 1996, Mary D. Nichols). The NEP required ADEQ to submit a NEAP to EPA by February 18, 2004, or eighteen months after the exceedance. ADEQ worked with local governments and stakeholders to develop the Yuma NEAP, including the identification of and commitment to implement best available control measures (BACM) to satisfy the requirements for abating sources of dust. The deadline for full implementation of control measures was August 18, 2005.

2.11.2 EPA Natural Events Policy

On May 30, 1996, EPA issued the NEP in a memorandum from Mary D. Nichols, Assistant Administrator for Air and Radiation. This memorandum announced EPA's new policy for protecting public health in all areas where the PM_{10} standard is violated due to natural events. Under this policy, EPA stated that, under certain circumstances, it is appropriate to exclude PM_{10} air quality data that are attributable to uncontrollable natural events from the decisions regarding an area's nonattainment status.

EPA's NEP sets forth the requirements for high PM_{10} concentrations caused by natural events. Under this policy, three categories of natural events are identified as affecting the PM_{10} levels: 1) volcanic and seismic activity; 2) wildland fires; and 3) high wind events such as the one that has precipitated this NEAP. The NEP defines high wind events as follows:

> "High Winds: Ambient PM_{10} concentrations due to dust raised by unusually high winds will be treated as due to uncontrollable natural events under the following

conditions: (1) the dust originated from nonanthropogenic sources, or (2) the dust originated from anthropogenic sources controlled with best available control measures (BACM)."

2.11.3 Natural Events Action Plan

In the event of a PM_{10} violation of the NAAQS caused by a natural event in a moderate PM_{10} nonattainment area, the state can develop and submit to EPA a plan of action to address future events. The following is a summary of the EPA guidance regarding development of a NEAP as provided in the NEP. The NEAP should:

1) Include documentation and analysis of the event showing a clear causal relationship between the measured exceedance and the natural event. Documentation of natural events and their impact on measured air quality should be made available to the public for review.

2) Be developed in conjunction with the stakeholders affected by the plan.

3) Identify, study, and implement practical mitigating measures as necessary. The NEAP may include commitments to conduct pilot tests of new emission reduction techniques. The NEAP must contain a timely schedule for conducting such studies. A state has eighteen months after the submittal of the NEAP to EPA to implement measures that are technologically and economically feasible.

4) Include programs that abate or minimize appropriate contributing controllable sources of PM_{10}. Programs to minimize PM_{10} emissions may include application of BACM to any sources of soil that have been disturbed by anthropogenic activities. The state has eighteen months after the submittal of the NEAP to EPA to implement these BACM. The Yuma area BACM were implemented within this timeframe. ADEQ documented the BACM in a NEAP implementation report. ADEQ sent the report to EPA on February 17, 2005.

5) Establish public notification and education programs. The public notification and education program in the Yuma area is designed to educate the public about the short-term and long-term harmful effects that high concentrations of PM_{10} could have on their health and inform them that: (a) certain types of natural events affect the air quality of the area periodically; (b) a natural event is imminent; and (c) specific actions are being taken to minimize the health impacts of events.

6) Include programs that help minimize public exposure to unhealthy concentrations of PM_{10} due to future natural events.

7) Be made available for public review and comment.

8) Be submitted to EPA for review and comment.

9) Commit the State to periodically reevaluate: (a) the conditions causing violations of a PM_{10} NAAQS in the area; (b) the status of implementation of the NEAP; and (c) the adequacy of the actions being implemented. ADEQ will reevaluate the Yuma NEAP every five years and make appropriate changes to the plan.

2.11.4 ADEQ Air Quality Exceptional and Natural Events Policy

ADEQ has developed and adopted an Air Quality Exceptional and Natural Events Policy, similar to EPA's NEP. It is ADEQ Policy 0159.000. The policy describes the requirements and procedures that are to be followed in the event of an air quality exceptional and natural event in Arizona. ADEQ developed this policy to govern the responses by the State and local jurisdictions to the occurrences of air quality natural events in Arizona, pursuant to A.R.S. § 49-424(3).

3.0 Air Quality Monitoring for Yuma Area Monitoring Network and Quality Assurance Procedures

The primary goal of monitoring in the Yuma/Somerton area is to collect the necessary data to ensure the maintenance area remains in compliance with the primary PM_{10} NAAQS. Toward that goal, monitoring has two specific objectives:

1. To fulfill the regulatory requirements for PM_{10} monitoring throughout the 10-year maintenance period, and

2. To determine the relative contributions of various particulate matter emission sources in the region toward the observed PM_{10} concentration in the maintenance area.

ADEQ established the Yuma County Juvenile Center monitoring site in February, 1988, to assess particulate concentrations in the Yuma area. The monitoring site has been designated the state and local air monitoring station (SLAM) site, neighborhood scale for population exposure. SLAMS sites are established by ADEQ to fulfill requirements of Section 110(a)(2)(B) of the CAA. ADEQ is required to monitor, compile, and analyze PM_{10} monitoring data on the ambient air quality of Yuma. The Yuma PM_{10} monitoring site is designed to measure concentrations in an area of population density. The Yuma sample frequency is every 6th day. The sample duration is 24 hours starting at 12:01am (midnight). The 1 in 6 schedule is defined by EPA.

3.1 Quality Assurance Procedures for Air Quality Monitoring

In Yuma, PM_{10} monitoring is conducted under the Final Draft Quality Assurance Project Plan for the Air Assessment Section, dated November 9, 2001. PM_{10} samples are collected with a dichotomous air monitor, using an EPA equivalent method designation.[1] An electrically powered air sampler draws ambient air at a constant volumetric flow rate, controlled by a microprocessor, into a specially shaped inlet where the suspended particulate matter in the PM_{10} size range is separated for collection on a 47mm polytetrafluoroethylene (PTFE) filter.

Each filter is weighed at the ADEQ Filter Lab in Phoenix (after moisture and temperature equilibration) before and after sample collection to determine the net weight (mass) gain due to collected PM_{10}. The lab is maintained at EPA-specified conditions. The total volume of air sampled is determined by the sampler from the measured flow rate at actual ambient temperature and pressure and the sampling time. The mass concentration of PM_{10} in the ambient air is computed as the total mass of collected particles in the PM_{10} size range divided by the actual volume of air sampled, and is expressed in micrograms per actual cubic meter of air.

[1] Equivalent method means a method for measuring the concentration of an air pollutant in the ambient air that has been designated as an equivalent method in accordance to 40 CFR Part 53 Subpart A; it does not include a method for which an equivalent method designation has been canceled in accordance with § 53.11 or § 53.16.

The data are reviewed using the three-level quality system before receiving final validation. These data are then formatted, summarized into the appropriate quarterly or annual averages, and reported to the ADEQ air assessment ambient database (AAAD) and the EPA Air Quality System (AQS) database. The air sampler is operated in accordance with applicable CFR requirements and quality assurance guidance. Regular checks of the stability, reproducibility, precision, and accuracy of the samplers and laboratory procedures are conducted by ADEQ.

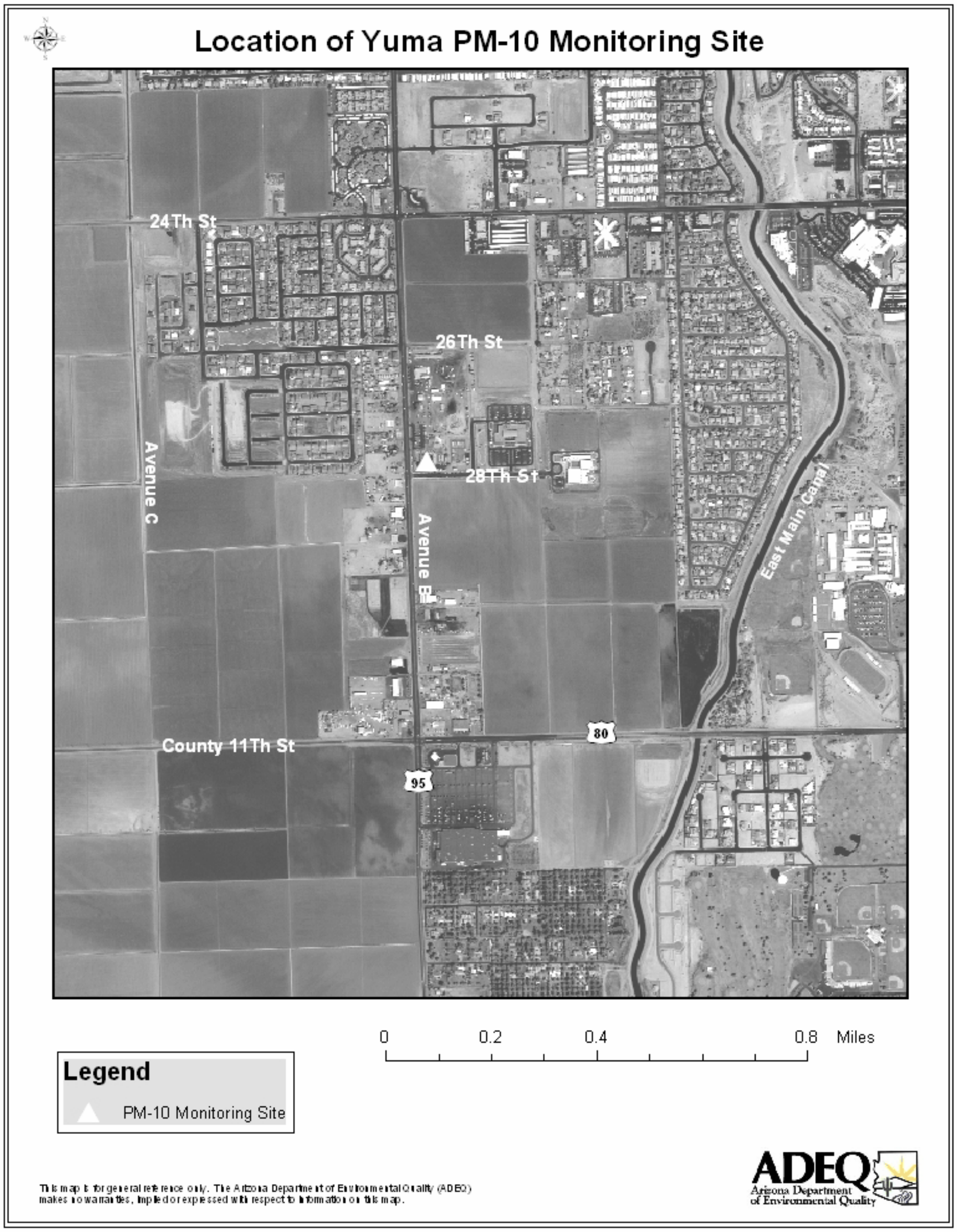
The initial location of the Yuma monitor, method, and parameters measured are detailed below in Table 3-1. Figure 3-1 shows the location of the Juvenile Center Monitoring Site in Yuma. The dichot samplers were moved from the Yuma Juvenile Center Monitoring Site to the Yuma County Courthouse Monitoring Site on June 13, 2002. Both dichots were replaced with one partisol sampler on August 6, 2002. A second Partisol sampler was added at the Yuma County Courthouse Monitoring Site for precision and accuracy on July 2, 2004.

Table 3-1. Parameters of the Yuma Monitoring Sites

Site Address	Began Operating	Latitude	Longitude	Type of Device	Parameters Measured	Classification	Scale	Objective
2795 Ave. B, Yuma, AZ	1988	32° 40'	114° 39'	Dichotomous Sampler	PM_{10}	State and Local Air Monitoring Station	neighborhood	general population exposure
2440 W. 28th St., Yuma, AZ	2002	32° 40'	114° 38'		Filter based PM_{10} R&P 2000 (duplicate measurement for precision), continuous PM_{10} with BAM1020	State and Local Air Monitoring Station	neighborhood	population exposure

Source: Air Quality Division, Assessment Section, 2005

Figure 3-1


Location of Yuma PM-10 Monitoring Site
24Th St
26Th St
28Th St
Avenue C
Avenue B
East Main Canal
County 11Th St
80
95
0
0.2
0.4
0.8 Miles
Legend
PM-10 Monitoring Site
This map is for general reference only. The Arizona Department of Environmental Quality (ADEQ) makes no warranties, implied or expressed with respect to information on this map.
ADEQ
Arizona Department of Environmental Quality

3.2 Monitoring and Precipitation

Precipitation can affect monitored PM_{10} levels. ADEQ obtained precipitation data for Yuma beginning with 1991 (see Table 3-2 below). As Table 3-2 reveals, annual rainfall for 1991 was below the 30-year average, but rose appreciably higher than the average through 1992 to 5.38 inches in 1993. From 1993, the annual precipitation continued to decrease to 0.34 inches in 1996. Rainfall increased to an all time high in 1997 when Yuma received 7.96 inches of rain. Then precipitation levels declined sharply until the year 2000 when the annual precipitation was only 1.62 inches. It increased to 3.48 inches in 2001. Yuma received the least amount of rainfall since 1991 in 2002 when the area only received 0.20 inches of rain for the entire year. Yuma had an usually wet year in 2004 when the total annual precipitation was 7.26 inches.

In spite of the fluctuations in annual precipitation, the Yuma area has experienced only one exceedance of the NAAQS, which does not count as a violation.

Table 3–2. Yuma Annual Precipitation, 1991 – 2004

	1991	1992	1993	1994	1995	1996	1997	1998
JAN	0.13	0.27	1.88	0.02	0.48	0.00	0.00	0.02
FEB	0.20	0.73	1.13	0.29	0.05	0.10	0.00	0.89
MAR	0.57	1.38	0.34	0.13	0.26	0.01	0.00	0.43
APR	0.00	0.13	0.00	0.00	0.17	0.00	0.00	0.02
MAY	0.00	0.27	0.01	0.28	0.00	0.00	0.00	0.01
JUN	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
JUL	0.00	0.00	0.00	0.00	0.20	0.00	0.32	0.06
AUG	0.01	0.23	0.07	0.06	0.00	0.18	0.00	0.32
SEP	0.12	0.00	0.02	2.07	0.03	0.02	5.37	1.84
OCT	0.13	0.00	0.86	0.00	0.00	0.03	0.14	0.00
NOV	0.06	0.00	1.07	0.01	0.03	0.00	0.00	0.04
DEC	0.62	1.70	0.00	1.35	0.00	0.00	1.96	0.19
TOTAL	1.84	4.71	5.38	4.21	1.22	0.34	7.96	3.82

Table 3-2 cont'd -- Yuma Annual Precipitation, 1991 – 2004

	1999	2000	2001	2002	2003	2004	Monthly Average
JAN	0.00	0.00	0.42	0.00	0.00	0.28	0.25
FEB	0.42	0.07	0.69	0.00	1.49	0.38	0.46
MAR	0.00	0.37	1.83	0.01	0.35	0.35	0.43
APR	1.19	0.00	0.12	0.00	0.04	0.03	0.12
MAY	0.00	0.00	0.00	0.00	0.00	0.00	0.04
JUN	0.03	0.00	0.00	0.00	0.00	0.00	0.01
JUL	0.36	0.00	0.18	0.00	0.59	0.00	0.12
AUG	0.04	1.15	0.10	0.00	0.51	0.98	0.26
SEP	0.20	0.00	0.00	0.08	0.18	1.07	0.79
OCT	0.00	0.03	0.12	0.09	0.00	1.88	0.23
NOV	0.00	0.00	0.01	0.02	0.41	0.47	0.15
DEC	0.00	0.00	0.01	0.00	0.03	1.82	0.55
TOTAL	2.24	1.62	3.48	0.2	0.44	7.26	0.28

SOURCE: Western Regional Climate Center, 2005

3.3 Monitoring Data – Yuma PM_{10} Concentrations in 1991 – 2004

Table 3-3 contains monitoring data for the Yuma area for 1991 to 2004. The 24-hour standard was exceeded at the Juvenile Center Monitoring Site twice in 1991 (229 and 188 μg/m^3) and once in 2002 (170 ug/m^3). The exceedances in 1991 were noteworthy because the Juvenile Center Monitoring Site was representative of the valley (lowest elevation inhabited area) and the active farming area. The annual standard has not been exceeded since 1990. Figure 3.2 is a diagram depicting the annual 24-hour highest and 2nd 24-hour highest PM_{10} concentrations in Yuma.

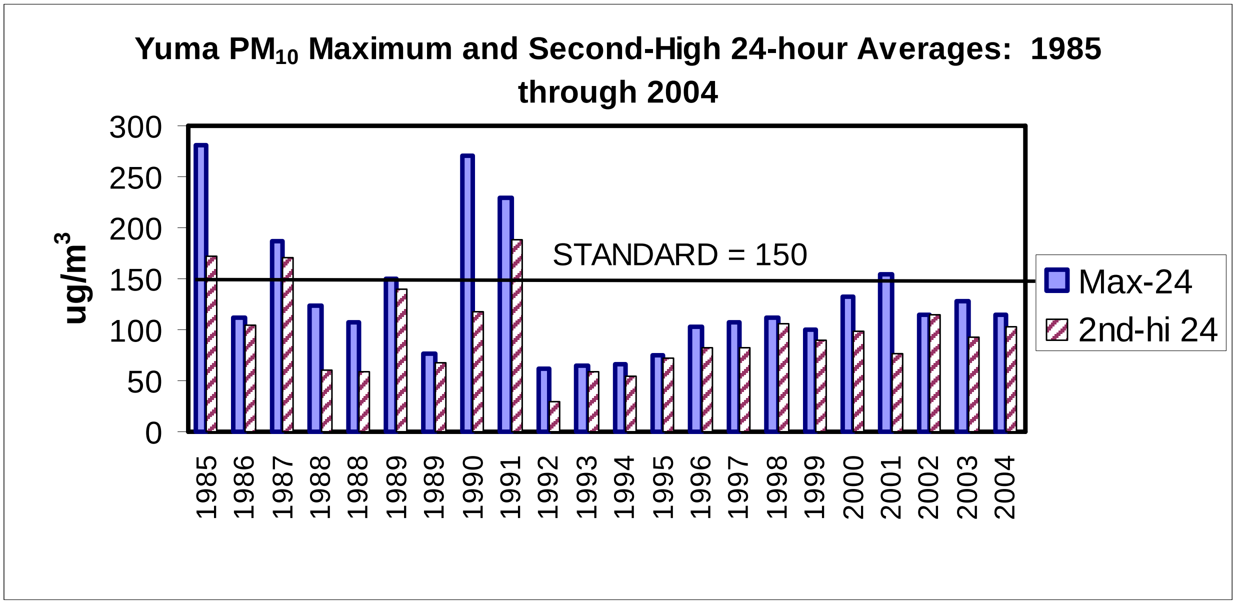
The exceedance of the 24-hr standard that occurred on August 18, 2002, was due to wind-generated dust event. An unusually large and intense thunderstorm developed in east-central Sonora, Mexico. By evening the thunderstorm had moved to the northwest through Yuma, producing sustained winds in excess of 25 miles per hour with gusts up to 45 miles per hour. Due to the high wind speeds, elevated concentrations of PM_{10} were experienced in Yuma. In the Imperial Valley, California and Baja California, Mexico, the average PM_{10} concentrations had values two to four times higher than those in Yuma. Other monitoring sites in the vicinity showed elevated concentrations as high as 700 μg/m^3 on a 24-hour basis.

Table 3-3. Exceedances of the PM_{10} NAAQS in the Yuma Nonattainment Area, 1991 – 2004

Year	Site	24-hour High (μg/m³)[1]	24-hour 2nd High (μg/m³)	Number of Exceedances of 24-hour Standard	Annual Average (μg/m³)[2]	Number of Exceedances of Annual Standard	Number of Samples
1991	Juvenile Center	229	188	2	48	0	48
1992	Juvenile Center	62	60	0	29	0	52
1993	Juvenile Center	65	59	0	31	0	47
1994	Juvenile Center	66	54	0	32	0	37
1995	Juvenile Center	75	72	0	35	0	47
1996	Juvenile Center	103	83	0	36	0	40
1997	Juvenile Center	108	83	0	36	0	34
1998	Juvenile Center	112	106	0	39	0	58
1999	Juvenile Center	100	90	0	37	0	56
2000	Juvenile Center	132	99	0	42.3	0	43
2001	Juvenile Center	150	77	0	40.6	0	27
2002	Juvenile Center	170	125	1[3]	47.1	0	53
2003	Juvenile Center	127	93	0	38.0	0	58
2004	Juvenile Center	125	125	0	45.2	0	58

1 24-hour average standard is 150 ug/m3.
2 Annual average standard is 50 ug/m3.
SOURCE: Air Quality Division, Assessment Section, 2005
3 EPA concurred with the data being flag, and a Natural Event Action Plan was submitted to EPA on February 17, 2004. A Natural Event Action Plan Implementation Report was submitted on August 17, 2005.

Figure 3–2. Annual High and 2nd-High 24-Hour PM_{10} Concentrations in Yuma



SOURCE: Air Quality Division, Assessment Section, 2005

PM_{10} concentrations reported at the Juvenile Center monitoring site between 2000 and 2004, showed one exceedance of the 24-hour PM_{10} NAAQS (see Table 3.3), caused by a high wind event. However, according to EPA's Natural Events Policy (NEP), this measurement does not count as a violation. Consequently, the three-year average number of exceedances was less than 1.0, which indicates Yuma attained the 24-hour PM_{10} NAAQS. Review of the annual standard for calendar years 2002, 2003, and 2004 reveals that the 3-year annual average was 43.4 $\mu g/m^3$. The design value is 87 percent of the annual standard. Yuma air quality did not violate the annual standard for the three-year period from 2002 through 2004. Thus, the Yuma area attained the annual PM_{10} NAAQS.

Based on the most recent three years of air quality data, the 24-hour average design value for the Yuma area is 127 $\mu g/m^3$. The design value is 85 percent of the 24-hour standard. ADEQ believes that the control measures modeled to reduce the 24-hour design value will concomittantly reduce the annual design value.

The attainment demonstration was modeled for seven design dates in 1999, with concentrations ranging from 19 to 102 ug/m^3. ADEQ believes that the control measures modeled to reduce the 24-hour design value will concomitantly reduce the annual design value.

Table 3.4 presents summary monitoring data for the Yuma Nonattainment Area for the 2002-2004 timeframe.

Table 3-4. 2002 - 2004 PM_{10} SUMMARY STATISTICS FOR THE YUMA NONATTAINMENT AREA
PM_{10} Concentrations are for Standard Conditions and are in ug/m^3

2002			2003			2004		
Date	Original	Duplicate	Date	Original	Duplicate	Date	Original	Duplicate
			12/29/03	0[a]		12/23/04	52	37
						12/29/04	23	23
Average Q1	53.8	<75%		30.9			32.2	
Average Q2	60.6	67.5		45.0			61.8	
Average Q3	38.3	<75%		33.8			55.4	
Average Q4	35.7			42.4			31.6	
Average (year)	47.1			38.0			45.2	
Std. Dev.	29.87	43.77		21.87			30.72	
N Samples	53	24		58			58	
Minimum	2	17		10			2	
Maximum	125	212		127			125	90
2nd high	115	116		93			125	66
3rd high	113	111		80			125	59
4th high	111	111		71			125	57
5th high	101	96		65			114	55

[a] The December 29, 2003 value of 0 was set to "no data". It's unreasonable to suppose the PM_{10} concentrations averaged for 24 hours in southwest Arizona would be lower than 5 ug/m^3. Consequently, the zero value was set to "no data".

No collocated samples were taken from 8/6/2002 through 7/1/2004.

SOURCE: Yuma Maintenance Plan Technical Support Document Demonstration of Attainment, January 25, 2005

4.0 Yuma Area Emissions Inventory

In order to develop control measures for the sources of PM_{10} in the Yuma Valley, ADEQ had to identify the significant sources of PM_{10} in the Yuma area. This chapter describes the local data and emission estimation methods used to develop 1999 and 2016 PM_{10} emission estimates for Yuma.

E. H. Pechan & Associates Inc. (Pechan), a consulting firm, was hired by ADEQ to develop the PM_{10} source inventory for Yuma. The starting point for the 1999 inventory preparation was Version 1.0 of EPA's National Emissions Inventory (NEI), which contains PM_{10} emission estimates for Yuma County. The projection year of 2016 was selected to meet the EPA requirement that there be a maintenance plan demonstrating that the PM_{10} NAAQS will still be met 10 years after the area is redesignated as an attainment area by EPA.

For most source categories, this chapter describes emission estimates only for the Yuma County portion of the Yuma Study Area, which includes portions of Imperial County, California and Baja California Norte, Mexico (Figure 4-1).

4.1 Wind-blown Dust

Wind-blown PM_{10} emissions were calculated for the following land use categories: alluvial plain and channels, agricultural crop lands, agricultural unpaved roads, native desert, urban disturbed areas, and miscellaneous disturbed areas (e.g., construction areas outside the City of Yuma). Emissions for the Imperial sand dunes were also assessed. No winds exceeding 30 mph were recorded by the Yuma Valley meteorological station in 1999. Hence, 1999 emissions for sand dunes were assumed to be negligible.

For agricultural lands, it was assumed that PM_{10} emissions are negligible during seasons when crops are present. Hence, emissions were only estimated during seasons when agricultural tilling occurs.

Table 4-1 provides Yuma Study Area acreage estimates for the land uses of interest (Sedlacek, 2002), as well as the emission factor types that were used to estimate PM_{10} emissions. ADEQ developed acreage estimates for the various types of land use with input from stakeholders. Hence, emission estimates were developed for the entire Yuma Study Area, not just Yuma County. Vacant agricultural acreage by season was assumed to be the same in the Imperial County and Mexico portions of the Study Area. For unpaved agricultural roads, ADEQ sampled several areas throughout the Study Area from satellite imagery to derive a factor (0.0815) to estimate the portion of agricultural land that was unpaved roads versus crop land.

A specific land use category for Urban Disturbed Areas (Code 295) was created to estimate emissions within the urbanized portions of the City of Yuma. This specific category allowed for more accurate characterization of the reductions in emissions associated with the 2013 (the original out-year for the maintenance period) reduction in disturbed area acres within the City of Yuma. This same 2013 reduction in disturbed area was assumed to be representative of 2016.

Figure 4-1. Yuma Study Area

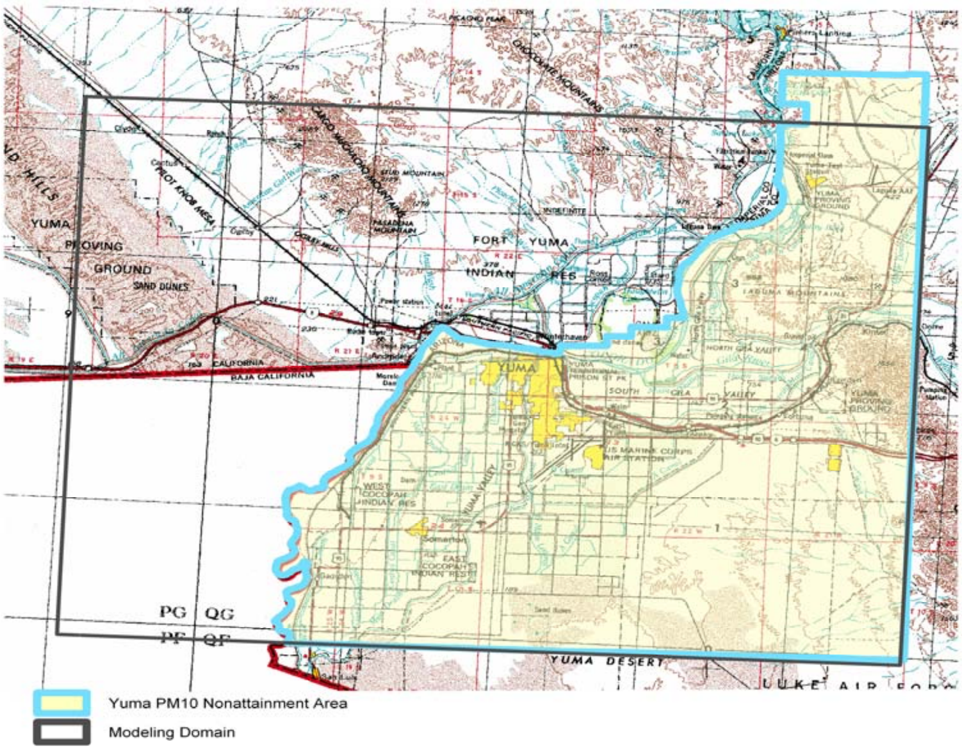


Table 4-1. 1999 Yuma Study Area Acreage Estimates by Land Use Category and Emission Factor Type

Land Use Category	Land Use Code	Acres	Emission Factor Type
Alluvial Plain and Channels	**440**	**141,227**	**Stabilized Land**
Native Desert	**390**	**74,252**	**Native Desert**
Vacant Agricultural Fields	**260**	**180,825**	**Disturbed Vacant**
Unpaved Ag Roads	**260**	**16,798**	**Disturbed Vacant**
Urban Disturbed Areas	**295**	**4,125**	**Disturbed Vacant**
Miscellaneous Disturbed Areas	**290**	**25,770**	**Disturbed Vacant**

SOURCE: E. H. Pechan and Associates, Inc., 2004

Table 4-2 contains the 1999 emission estimates for windblown dust for the Yuma Study Area. For native and stabilized lands, emissions are calculated using the number of wind events. This method is based on the assumption that after a short period of high winds on native and stabilized lands, most of the dust capable of being entrained by the wind has already been removed (i.e., the limited reservoir theory). Table 4-2 shows that the highest PM_{10} emissions in 1999 in the Yuma area occurred during the winter season with over 56,000 tons of emissions. Emissions during the fall followed at over 41,000 tons. Dust emissions during the spring of 1999 amounted to over 25,000 tons. Emissions of PM_{10} were the lowest during the summer season at around 6,800 tons.

Table 4-2. 1999 Yuma Study Area PM_{10} Emission Estimates for Windblown Dust

		Emissions by Season (tons)				
Land Use Category	Acres	Fall	Winter	Spring	Summer	Total Annual (PM_{10} tons)
Alluvial Plain and Channels	**141,227**	**463**	**926**	**771**	**356**	**2,517**
Native Desert	**74,252**	**191**	**191**	**0**	**0**	**382**
Vacant Agricultural Fields	**180,825**	**23,464**	**33,628**	**6,934**	**1,809**	**65,835**
Unpaved Agricultural Roads	**16,798**	**6,228**	**7,810**	**6,442**	**1,680**	**22,160**
Urban Disturbed Areas	**4,125**	**1,529**	**1,918**	**1,582**	**413**	**5,442**
Miscellaneous Disturbed Areas	**25,770**	**9,554**	**11,981**	**9,883**	**2,578**	**33,996**
	Totals	41,430	56,453	25,612	6,836	130,331

SOURCE: E. H. Pechan and Associates, Inc., 2004

Emission estimates for 2016 are provided in Table 4-3. It was assumed that the winds in 2016 would be similar to those observed in 1999. The only significant change in the activity data (acreage estimates) between 1999 and 2016 was the reduction of urban disturbed acreage; hence, the emission estimates for the entire Study Area are very similar. A small amount of agricultural land is lost to urban development in 2016.

Table 4-3. 2016 Yuma Study Area PM_{10} Emission Estimates for Windblown Dust

		Emissions by Season (tons)				
Land Use Category	**Acres**	**Fall**	**Winter**	**Spring**	**Summer**	**Total Annual (PM_{10} tons)**
Alluvial Plain and Channels	**141,227**	**463**	**926**	**771**	**356**	**2,517**
Native Desert	**74,252**	**191**	**191**	**0**	**0**	**382**
Vacant Agricultural Fields	**179,048**	**23,234**	**33,297**	**6,866**	**1,791**	**65,188**
Unpaved Agricultural Roads	**16,633**	**6,167**	**7,733**	**6,379**	**1,664**	**21,942**
Urban Disturbed Areas	**2,290**	**849**	**1,065**	**878**	**229**	**3,021**
Miscellaneous Disturbed Areas	**25,770**	**9,554**	**11,981**	**9,883**	**2,578**	**33,996**
	Totals	40,458	55,193	24,777	6,618	127,046

SOURCE: E. H. Pechan and Associates, Inc., 2004

In developing emissions for the unpaved roads in the Yuma area, unpaved road emissions were broken out into two subcategories: emissions from unpaved public roads and emissions from agricultural roads. The emissions for unpaved public roads is assumed to be 15% of the total (i.e. 15% of the unpaved road travel occurs on unpaved public roads), while the remaining 85% of emissions occur from agricultural roads (Ramos, 2003).

Vehicle miles traveled (VMT) data and the mean vehicle speed were obtained from the PM_{10} emissions analysis conducted as part of the Yuma Metropolitan Planning Organization (YMPO) Model and Air Quality Conformity Analysis project. The report indicates that the 1999 unpaved road daily VMT, calculated using TransCAD GIS-based modeling software, is 98,864 miles (Lima & Associates, 2000). The projected daily unpaved road VMT for 2016 is 64,240 miles. This value was estimated by calculating the annual growth rate between 2013 and 2025 unpaved road VMT projections (Lima & Associates, 2002). This annual growth rate of 6.1 percent per year was then used to estimate three additional years of growth from 2013.

EPA's PART5 model was used to obtain the reentrained road dust, brake wear, and tire wear portions of the paved road emission factors (EPA, 1995) in the Yuma Study Area. As part of the PART5 output, the paved road reentrained road dust plus brake wear emission factors are available. These emission factors are shown in Table 4-4. Also, based on the PART5 output, the brake wear accounts for 0.013 grams per mile in all of the PART5 emission factors. Table 4-4 also shows the PART5 tire wear emission factor. This value does not change by road type or year. MOBILE6.1, another EPA model, was used to calculate 1999 and 2016 exhaust emission factors (EPA, 2002). The MOBILE6.1 exhaust emission factors account for Tier 2 emission standards and 2007 heavy duty emission standards that are not incorporated in PART5. These exhaust emission factors are shown in Table 4-4. However, MOBILE6.1 does not include reentrained road dust emission factors, while both PART5 and MOBILE6.1 use the same information for calculating brake wear and tire wear emission factors. Therefore, the PART5 emission factors for fugitive dust and brake and tire wear, and the MOBILE6.1 exhaust emission factors were used to calculate emission factors, because they are more representative of the 1999 and 2016 vehicle populations.

Daily VMT estimates were obtained from the PM_{10} emissions analysis prepared by Lima & Associates for the Arizona Department of Transportation (ADOT) and the YMPO (Lima & Associates, 2000). VMT for each roadway type was estimated using TransCAD GIS based modeling software. Lima & Associates projected 2013 and 2025 daily VMT on paved roads (Lima & Associates, 2002). Daily VMT estimates were not available for 2016 for this analysis. Therefore, the average annual growth rate was calculated for each road type from 2013 to 2025. Three years of growth at this annual growth rate were then applied to the 2013 VMT by road type to estimate 2016 average daily VMT on paved roads. The 1999, 2013, and 2025 VMT, as well as the calculated annual growth rates between 2013 and 2025, and the estimated 2016 VMT are all shown in Table 4-5.

Table 4-4. 1999 and 2016 PM_{10} Paved Road Emission Factors by Road Type

Roadway Type	Speed (mph)	Silt Loading (g/m^2)	AP-42 Equation, 1999 & 2016 (includes Reentrained Dust, Brake Wear, Tire Wear, and Exhaust)	PART5 1999 and 2016 Paved Road Reen-trained Dust plus Brake Wear Emission Factor (g/mi)	PART5 1999 and 2016 Tire Wear Emission Factor (g/mi)	1999 MOBILE6.1 PM_{10} Exhaust Emission Factor (g/mi)	2016 MOBILE6.1 PM_{10} Exhaust Emission Factor (g/mi)	1999 Total Paved Road PM_{10} Emission Factor (includes Reentrained Dust, Tire Wear, Brake Wear, and Exhaust)	2016 Total Paved Road PM_{10} Emission Factor (includes Reentrained Dust, Tire Wear, Brake Wear, and Exhaust)
Interstate	55	0.04	0.57	0.37	0.009	0.064	0.011	0.443	0.390
Principal Arterials	42	0.3	2.13	1.92	0.009	0.064	0.011	1.993	1.940
Minor Arterials	40	0.3	2.13	1.92	0.009	0.064	0.011	1.993	1.940
Rural Major Collectors	45	0.7	3.69	3.49	0.009	0.064	0.011	3.563	3.510
Rural Minor Collectors	46	0.7	3.69	3.49	0.009	0.064	0.011	3.563	3.510
Urban Collectors	35	0.24	1.84	1.64	0.009	0.064	0.011	1.713	1.660
Local Roads	35	0.85	4.19	3.98	0.009	0.065	0.011	4.054	4.000
Interstate Ramps	35	0.04	0.57	0.37	0.009	0.064	0.011	0.443	0.390
Local	20	0.85	4.19	3.98	0.009	0.065	0.011	4.054	4.000

NOTES: Emission factors are in grams per mile.

SOURCE: E. H. Pechan and Associates, Inc., 2004

As with unpaved roads, the paved road reentrained dust emission factors were corrected for the effects of precipitation. Only the fugitive dust portion of the emission factor was adjusted for precipitation effects. No adjustments were applied to the brake wear, tire wear, or exhaust portions of the emission factors.

4.1.1 Road Construction Emissions

Construction emissions are estimated using two basic construction parameters, the acres of land disturbed by the construction activity and the duration of the activity. Data on the actual acres disturbed by road construction are generally not available, so a surrogate is used. The 1999 NEI emission estimation methods for road construction use the following miles to acres conversions by roadway type:

Interstate, urban and rural; Other arterial, urban – 15.2 acres/mile
Other arterial, rural – 12.7 acres/mile
Collectors, urban – 9.8 acres/mile
Collectors, rural – 7.9 acres/mile

Table 4-5. 1999 and 2016 Daily VMT by Road Type

Road Type	1999 Daily VMT (miles per day)	2013 Daily VMT (miles per day)	2025 Daily VMT (miles per day)	Average Annual Growth Rate from 2013 to 2025	Estimated 2016 Daily VMT (miles per day)
Interstate	**541,163**	**866,379**	**986,872**	**1.09%**	**895,048**
Principal Arterials	**860,715**	**1,564,166**	**1,768,187**	**1.03%**	**1,612,851**
Minor Arterials	**672,408**	**1,137,824**	**1,443,793**	**2.00%**	**1,207,626**
Rural Major Collectors	**91,129**	**198,520**	**289,087**	**3.18%**	**218,077**
Rural Minor Collectors	**448,640**	**870,923**	**1,028,207**	**1.39%**	**907,831**
Urban Collectors	**139,709**	**232,904**	**271,676**	**1.29%**	**242,045**
Local Roads	**4,841**	**17,387**	**21,204**	**1.67%**	**18,271**
Interstate Ramps	**50,581**	**84,437**	**94,825**	**0.97%**	**86,922**
Local Paved	**889,680**	**1,361,490**	**1,678,386**	**1.76%**	**1,434,610**
Total	3,698,866	6,334,030	7,582,237		6,623,281

SOURCES:The 1999 Daily VMT estimates are from Lima & Associates, 2000. The 2013 and 2025 Daily VMT estimates are from Lima & Associates, 2002.

The number of miles of highway constructed in 1999 and 2013 projections were provided by local officials. Activity in 2016 is assumed to be equivalent to the 2013 projected activity (see Table 4-6). The type of roadways constructed was not available; therefore, 9.8 acres/mile was assumed for all roads.

Table 4-6. 1999 and 2016 Miles of Roadway Constructed and PM_{10} Emissions

Location	1999 Miles of Roadway Constructed	1999 Emissions (tons)	2016 Miles of Roadway Constructed	2016 Emissions (tons)
Somerton	**2.52**	**1,383**	**0**	**0**
City of Yuma	**7.2**	**3,951**	**11.1**	**6,092**
Yuma Co.	**1.9**	**384**	**3.6**	**2,634**
ADOT	**0.7**	**1,043**	**4.8**	**1,976**
Total		6,761		10,702

SOURCE: E. H. Pechan and Associates, Inc., 2004

Emissions were calculated using the total acres disturbed, the PM_{10} emission factor of 0.42 tons/acre/month, and the activity duration, estimated to be 12 months. Adjustments were made to the PM_{10} emissions to account for conditions in Yuma including correction parameters for soil moisture level and silt content (MRI, 1999).

Soil moisture levels were estimated using precipitation-evaporation values from Thornthwaite's PE Index. The PE value for Yuma County is 6. A silt content value of 40 percent was used. This value was used to calculate 1999 NEI emissions for Yuma County and was determined by comparing the U.S. Department of Agriculture surface soil map with the county map.

4.1.2 General Building Construction Emissions

This emissions category includes PM_{10} emissions from residential building (housing) construction and commercial building construction. Housing construction PM_{10} emissions were calculated using an emission factor of 0.032 tons PM_{10}/acre/month, the number of housing units constructed, a units-to-acres conversion factor, and the duration of construction activity. The duration of construction activity is assumed to be 6 months (MRI, 1999).

Apartment construction emissions were computed separately using an emission factor that is more representative of emissions from apartment building construction (0.11 tons PM_{10}/acre/month). A 12-month duration is assumed for apartment construction. The same emission factor and duration were used for warehouse construction.

The total acres disturbed by construction is estimated by applying conversion factors to the housing start data for each category as follows:

Single family - 1/4 acre/building
Two family - 1/3 acre/building
Apartment - ½ acre/building or 1/20 acre/unit

These conversion factors were used unless they were larger than 1999 average lot sizes reported by local officials. Average lot size was used for all Yuma County buildings and City of Yuma single family houses and duplexes. The warehouse average lot size of 7 acres provided by the City of Yuma seemed excessively large, and there were no acres per building conversion factors available for warehouses. Therefore, the average warehouse lot size provided by Yuma County was also used for the 8 warehouses constructed in the City of Yuma.

The number of single-family, two-family, and apartment buildings and warehouses constructed in 1999 and 2013 projections were provided by Somerton, Yuma, and Yuma County officials. The data provided by Somerton combined single-family and two-family data; therefore, all units were assumed to be single-family buildings. The number of single family houses, duplexes, and warehouses constructed in 1999 and 2013 projections and the acre/unit used for each is shown in Table 4-7. Activity in the 2016 projection year is assumed to be the same as projected for 2013. The 1999 and 2016 emission estimates in tons per year (tpy) for building construction are given in Table 4-8.

Table 4-7. 1999 and 2013 Housing Starts and Acres/Unit Conversions

		1999		2013	
Unit Type		No. of Units	Acres/Unit	No. of Units	Acres/Unit
Yuma Co.	**single family**	**370**	**0.25**	**370**	**0.25**
	warehouses	**8**	**1.30**	**8**	**1.30**
City of Yuma	**single family**	**251**	**0.184**	**1533**	**0.184**
	duplex	**2**	**0.184**	**6**	**0.184**
	apartment	**44**	**0.05**	**111**	**0.05**
	warehouses	**8**	**1.30**	**7**	**1.30**
Somerton	**single family**	**393**	**0.25**	**393**	**0.25**
	apartment	**84**	**0.05**	**84**	**0.05**

SOURCE: E. H. Pechan and Associates, Inc., 2004

Table 4-8. 1999 and 2016 PM_{10} Emission Estimates for Building Construction

Area	Unit Type	1999 Emissions (tons)	2016 Emissions (tons)
Yuma Co.	**single family**	**11.1**	**11.1**
	warehouses	**14.8**	**14.8**
City of Yuma	**single family**	**5.51**	**33.8**
	duplex	**0.04**	**0.13**
	apartment	**1.82**	**9.16**
	warehouses	**14.8**	**13.0**
Somerton	**single family**	**3.24**	**3.24**
	apartment	**2.48**	**2.48**
Totals		53.8	87.7

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.2 Aircraft Emissions

The basic method for estimating emissions for this category involves determining aircraft fleet make-up and level of activity and this is matched with the appropriate emission factors by aircraft type to estimate daily or annual emissions. Aircraft emission estimates focus on emissions that occur close enough to the ground to affect ground-level concentrations. Aircraft operations within this layer are defined as landing and takeoff (LTO) cycle. The five specific operating modes in an LTO are:

Approach
Taxi/idle-in
Taxi/idle-out
Takeoff
Climb-out

The following PM_{10} emission factors were used for calculating emissions (EPA, 1992):

Air Taxi: 0.60333 pounds/LTO
Military Aircraft: 0.60333 pounds/LTO

Air taxi refers to small aircraft used for scheduled service carrying passengers and/or freight.

LTO information was provided by the U.S. Border Patrol, the Marine Corps Air Station, the Yuma Proving Ground, and Yuma International Airport, shown in Table IV-21. The number of flights per day is expected to decrease at Yuma International Airport between 1999 and 2013 due to a decrease in the number of passengers to the Yuma market and the subsequent increased fares to Yuma. The 2013 estimates provided by the sources above are assumed to be representative of 2016 activity.

Table 4-9. 1999 and 2016 LTO Data and Emission Estimates for Yuma Airports

Airport	1999 Daily LTOs	1999 Emissions (tons)	2016 Daily LTOs	2016 Emissions (tons)
U.S. Border Patrol	**2**	**0.22**	**6**	**0.66**
Marine Corp Air Station	**60**	**6.60**	**69**	**7.60**
Yuma Proving Ground	**54**	**5.95**	**54**	**5.95**
Yuma Intl. Airport	**25**	**2.75**	**20**	**2.20**
Total		15.5		16.4

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.2.1 Unpaved Airstrips

PM_{10} emissions from unpaved airstrips were estimated using the same equation as was used for unpaved roads. The soil silt content and moisture content were assumed to be 3 percent and 1 percent, respectively. An average speed of 40 mph was used, and the length of one LTO was assumed to be 1 mile. The number of flights per week for the two unpaved airstrips in the Yuma nonattainment area, shown in Table 4-10, was provided by local officials. The number of LTOs estimated by these officials for 2013 is assumed to be representative of activity in 2016.

Table 4-10. 1999 and 2016 LTO Data and Emissions for Unpaved Airstrips

		1999			2016	
Airstrip	Flights per Week	Average Annual LTOs	Emission (lbs)	Flights per Week	Average Annual LTOs	Emission (lbs)
Somerston	**7-10**	**442**	**202**	**15**	**780**	**356**
Pierce Aviation	**70-80**	**3,900**	**1,781**	**70-80**	**3,900**	**1,781**
Total		4,342	1,982		4,680	2,137

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.3 Stationary Sources

1999 PM_{10} emissions for 5 categories of stationary sources, shown in Table 4-11, were provided by ADEQ. Emissions for 2016 were calculated by applying growth factors to the 1999 emissions. The growth factors were based on industry sector constant dollar output projections from Regional Economics Model, Inc. (REMI) economic models incorporated into Version 4.0 of the Economic Growth Analysis System (EGAS) (Pechan, 2001). Table 4-12 shows the 1999 and 2016 REMI data for each sector. The growth factors, the ratio of 2016 output to 1999 output, are also shown in Table 4-12. The growth factor for manufacturing stationary sources was calculated by summing the REMI data for REMI sectors 1 (lumber and wood products), 3 (stone, clay, and glass products), 16 (paper and allied products), and 18 (chemical and allied products).

Table 4-11. 1999 and 2016 PM_{10} Stationary Source Emissions

Sector	1999 Emissions (tons)	2016 Emissions (tons)
Support activities for agriculture	**10**	**14**
Utilities	**50**	**73**
Manufacturing	**6**	**11**
National Security	**1**	**1**
Rock Products	**10**	**20**
Total	77	119

SOURCE: E. H. Pechan and Associates, Inc., 2004

Table 4-12. 1999 and 2016 REMI Data and Growth Factors

Sector	REMI Sector	1999 REMI Data	2016 REMI Data	2016 Growth Factor
Support activities for agriculture	**49**	**0.656**	**0.893**	**1.361**
Utilities	**30**	**1.883**	**2.740**	**1.455**
Manufacturing	**1,3,16, and 18**	**3.839**	**10.267**	**1.877**
National Security	**52**	**4.608**	**4.800**	**1.042**
Rock Products	**3**	**1.631**	**3.291**	**2.018**

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.4 Railroad Locomotives

The 1999 NEI estimates that railroad locomotives contribute 17 tpy of PM_{10} in the Yuma Nonattainment Area. Estimation methods are described in the Trends Procedures Document (EPA, 2001a). Future year activity changes affecting emission estimates are based on earnings projections for Railroad Transportation.

In January 1997, EPA proposed draft locomotive emission standards to control emissions of oxides of nitrogen, volatile organic compounds, carbon monoxide, PM, and smoke from newly manufactured and remanufactured diesel-powered locomotives and locomotive engines. In December 1997, EPA promulgated the locomotive emission standards (EPA, 1997). The locomotive standards are to be implemented in three phases, depending on the manufacture date. Tier 0 applies to the remanufacturing of locomotives and locomotive engines manufactured from 1973 through 2001. Tier I applies to the original manufacture and remanufacturing of locomotives and locomotive engines manufactured from 2002 through 2004. Tier II applies to the original manufacture and remanufacturing of locomotives and locomotive engines manufactured in 2005 and later. When fully phased-in by 2040, EPA estimates that the rule will achieve a 46 percent reduction in PM emissions. Emission estimates for 1999 and 2016 are shown in Table 4-13 below.

4.5 Summary of Stationary and Area Source Emissions for the Yuma Area

Table 4-13 summarizes the 1999 and 2016 PM_{10} emissions by source category developed by Pechan and Associates, Inc. for the Yuma area. These source categories are listed in the same order that they appear in this chapter. With the exception of windblown dust, the emission estimates summarized in Table 4-13 are for the Yuma County portion of the nonattainment area. In total, 2016 emissions are expected to be at the same level that they were in 1999. The largest PM_{10} emission reductions between 1999 and 2013 come from paving unpaved roads, and through reducing the acreage that is susceptible to windblown dust. These PM_{10} emission reductions are offset by increased PM_{10} emissions resulting from increased travel on paved roads and more road construction occurring in 2016 than in 1999. Agriculture-related PM_{10} emissions are expected to remain steady during the study period.

Table 4-13. Yuma PM_{10} Nonattainment Area Emissions Summary - 1999 and 2016

	1999 Annual Emissions (tons)	2016 Annual Emissions (tons)
Agricultural and Prescribed Burning	**40.7**	**34.1**
Agricultural Tilling	**3,572**	**3,572**
Agricultural Cultivation and Harvesting	**15.7**	**15.7**
Windblown Dust	**130,331**	**127,046**
Unpaved Roads - Re-entrained Dust	**10,183**	**5,537**
Paved Roads	**3,419**	**5,839**
Road Construction	**6,761**	**10,702**
General Building Construction	**53.8**	**87.7**
Aircraft	**15.5**	**16.4**
Unpaved Airstrips	**1.0**	**1.1**
Stationary Sources	**77**	**119**
Railroad Locomotives	**17**	**15**
Total	154,487	152,985

NOTES: With the exception of windblown dust, all emission estimates are for the Yuma County portion of the nonattainment area.

SOURCE: E. H. Pechan and Associates, Inc., 2004

4.6 Mobile Source Emissions Budgets

Mobile sources are also a source of PM_{10} emissions in the Yuma area. Their impact on the air quality of the Yuma area has to be assessed in the context of attaining the PM_{10} NAAQS and complying with the NAAQS throughout the maintenance period. Transportation conformity regulations in 40 CFR Part 93, Subpart A require that mobile source emissions budgets be calculated for the Yuma area. To this end, the Yuma Metropolitan Planning Organization and their contractor, Lima and Associates, Inc., have forecasted mobile source emissions in the Yuma area for 2004, 2008, and the maintenance year of 2016. Since these forecasts were not part of the area source and point source emissions inventory developed by Pechan and Associates, Inc, they are presented here in Tables 4-14, 4-15, and 4-16, respectively.

Table 4-14. Mobile Sources Emissions Data Used in the Calculation of the Mobile Source Emissions Budgets for the Yuma Nonattainment Area for the Year 2004

Facility Type	Daily VMT (miles)	Daily VHT	Modeled Speed	Speed Used	Silt Loading	Factor (kg/mi)	Total (kg/day)
Interstate	450,868	8,738	51.60	55.00	0.040	0.000370	166.8
Principal Arterials	972,027	25,688	37.84	42.00	0.040	0.001920	1,866.3
Minor Arterials	741,717	22,402	33.11	40.00	0.070	0.001920	1,424.1
Rural Major Collectors	51,790	1,188	43.57	45.00	0.240	0.003490	180.7
Rural Minor Collectors	396,212	9,730	40.72	46.00	0.240	0.003490	1,382.8
Urban Collectors	136,550	5,039	27.10	35.00	0.240	0.001640	223.9
Local Roads	5,043	144	34.97	35.00	0.580	0.003980	20.1
Interstate Ramps	43,629	1,440	30.30	35.00	0.040	0.000370	16.1
Local Paved	1,003,951			20.00	0.580	0.003980	3,995.7
Local Unpaved	72,281			10.00	0.580	0.108570	7,847.5
DAILY TOTAL	3,874,068	74,369					17,124.0

*PM10 Emissions (tons/day) – 18.88
*PM10 Emissions (tons/year) – 6,891.2

SOURCE: Yuma Metropolitan Planning Organization and Lima and Associates, Inc. 2005

Table 4-15. Mobile Sources Emissions Data Used in the Calculation of the Mobile Source Emissions Budgets for the Yuma Nonattainment Area for the Year 2008

Facility	Daily VMT (miles)	Daily VHT	Modeled Speed	Speed Used	Silt Loading	Factor (kg/mi)	Total (kg/day)
Interstate	507,964	9,863	51.50	55.00	0.040	0.000370	187.9
Principal Arterials	1,089,183	28,830	37.78	42.00	0.040	0.001920	2,091.2
Minor Arterials	853,125	25,899	32.94	40.00	0.070	0.001920	1,638.0
Rural Major Collectors	73,965	1,758	42.17	45.00	0.240	0.003490	258.1
Rural Minor Collectors	468,916	11,871	39.50	46.00	0.240	0.003490	1,636.5
Urban Collectors	156,972	5,792	27.10	35.00	0.240	0.001640	257.4
Local Roads	5,176	149	34.71	35.00	0.580	0.003980	20.6
Interstate Ramps	49,491	1,784	27.74	35.00	0.040	0.000370	18.3
Local Paved	1,165,752			20.00	0.580	0.003980	4,640.0
Local Unpaved	76,469			10.00	0.580	0.108570	8,302.2
Daily Totals	4,447,013	85,946					19,050.2

*PM_{10} Emissions (tons/day) – 21.00
*PM_{10} Emissions (tons/year) – 7,664.7

SOURCE: Yuma Metropolitan Planning Organization and Lima and Associates, Inc. 2005

Table 4-16. Mobile Sources Emissions Data Used in the Calculation of the Mobile Source Emissions Budgets for the Yuma Nonattainment Area for the Year 2016

Facility	Daily VMT (miles)	Daily VHT	Modeled Speed	Speed Used	Silt Loading	Factor (kg/mi)	Total (kg/day)
Interstate	662,471	12,659	52.33	55.00	0.040	0.000370	245.1
Principal Arterials	1,466,306	41,539	35.30	42.00	0.300	0.001920	2,815.3
Minor Arterials	1,007,532	32,696	30.82	40.00	0.300	0.001920	1,934.5
Rural Major Collectors	166,904	3,834	43.53	45.00	0.700	0.003490	582.5
Rural Minor Collectors	870,323	23,261	37.42	46.00	0.700	0.003490	3,037.4
Urban Collectors	247,995	8,699	28.51	35.00	0.240	0.001640	
Local Roads	5,176	149	34.71	35.00	0.580	0.003980	20.6
Interstate Ramps	49,491	1,784	27.74	35.00	0.040	0.000370	18.3
Local Paved	1,165,752			20.00	0.580	0.003980	4,640.0
Local Unpaved	76,469			10.00	0.580	0.108570	8,302.2
Daily Totals	4,447,013	85,946					19,050.2

*PM_{10} Emissions (tons/day) – 21.00
*PM_{10} Emissions (tons/year) – 7,664.7

SOURCE: Yuma Metropolitan Planning Organization and Lima and Associates, Inc. 2005